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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,212	02/25/2002	Souichi Katagiri	NITT.0063	2863

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EXAMINER

ROMAN, ANGEL

ART UNIT PAPER NUMBER

2812

DATE MAILED: 04/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/081,212

Applicant(s)

KATAGIRI ET AL.

Examiner

Angel Roman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 12-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 17-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-11 and 17-19) in Paper No. 7 is acknowledged.

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The abstract of the disclosure is objected to because it exceeds 150 words. Correction is required. See MPEP § 608.01(b).

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Process For Chemical-Mechanical Planarization of Conductive Films Using Two Processing Liquids.

Claim Objections

5. Claims 1 and 3 are objected to because of the following informalities: "the second processing liquid", should be replaced with --a second processing liquid--. Appropriate correction is required.

6. Claim 4 is objected to because of the following informalities: In line 2, "the distance", should be replaced with --a distance--. Appropriate correction is required.

7. Claims 9, 10 and 19 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 9 and 10 disclosed Apparatus limitations; therefore they fail to further limit the claimed method steps of independent claims 1 and 2 respectively.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 9, 10 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. Claim 9 recites the limitation "the abrasive grains" in line 2. There is insufficient antecedent basis for this limitation in the claim.

11. Claim 10 is rejected for its dependency on rejected claim 9.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

13. Claim 1 is rejected under 35 U.S.C. 102(e) as being clearly anticipated by Bajaj et al. U.S. Patent 6,204,169 B1.

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Bajaj et al. discloses a method for manufacturing a semiconductor device wherein for a substrate as a workpiece in which an insulation film 255 is formed on the substrate, openings are formed in the insulation film 255, a first conductive film 256 is formed in the inside of the openings and on the surface of the insulation film, and a second conductive film 258 is formed on the first conductive film 256, by planarizing the second conductive film 258 and part of the first conductive film 256 using a fixed abrasive tool (see column 1, lines 26-67)), the first and the second planarized conductive films are formed in the openings(see figure 4), said method comprising: supplying a first processing liquid (slurry) upon planarization of the second conductive film 258 and switching the supply of the liquid from the first processing liquid to a second processing liquid upon planarization of the second and the first conductive film (see Abstract).

14. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Mravic et al. U.S. Patent 6,083,840 A.

Mravic et al. discloses a method for manufacturing a semiconductor device wherein for a substrate as a workpiece in which an insulation film 10 is formed on the substrate, openings are formed in the insulation film, a first conductive film 15 is formed in the inside of the openings and on the surface of the insulation film 10, and a second conductive film 18 is formed on the first conductive film 15, by planarizing the second conductive film 18 and part of the first conductive film 15 using a fixed abrasive tool, the first and the second planarized conductive films are formed in the openings, said

method comprising; supplying a first processing liquid upon planarization of the second conductive film 18 and switching the supply of the liquid from the first processing liquid to a second processing liquid upon planarization of the second and the first conductive films (see column 4, lines 46-67). Mravic et al. also discloses the first and the second processing liquids contain an oxidizing agent (from 0.5-50%hydrogen peroxide), an organic acid (from 0.1-0.2% malic acid), a corrosion inhibitor (from 0.1-0.4% benzotriazole) and water (see columns 5-8). The concentration of the oxidizing agent is different between the first and the second processing liquids (see tables 1-3).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

17. Claims 2-11 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mravic et al. U.S. Patent 6,083,840 A in view of Harada et al. U.S. Patent 6,476,491 B2.

Mravic et al. is applied as above but lacks anticipation on disclosing a tool dressing process wherein a surface of a fixed abrasive tool is dressed using a height adjustable diamond dresser before planarization of the second and the first conductive film; disclosing a distance of the insulative film between adjacent openings within a range of 30 micrometers to 0.1 micrometers, and dishing and erosion on the planarized surface of 40 nm or less; disclosing purified water as a component in the aqueous slurry solution; and disclosing abrasive grains of a fixed abrasive tool comprising fumed silica fixed with a resin having a compression modulus of elasticity from 500 MPa to 1000 Mpa.

With respect to disclosing a tool dressing process wherein a surface of a fixed abrasive tool is dressed using a height adjustable diamond dresser before planarization of the second and the first conductive film, Harada et al. discloses a tool dressing process wherein a surface of a fixed abrasive tool is dressed using a height adjustable diamond (see column 21, lines 1-10 and 65-67) dresser before planarization of plural conductive films (see figure 16c). In view of this disclosure, it would have been obvious to a person having ordinary skills in the art at the time the invention was made to disclose a tool dressing process wherein a surface of a fixed abrasive tool is dressed using a height adjustable diamond dresser before planarization of the conductive films

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as disclosed in Harada et al. in the primary reference of Mravic et al. since it would condition the abrasive tool and it would prevent damage and contamination to the device. Furthermore, performing abrasive tool dressing operations before polishing substrates is conventional in Chemical Mechanical Polishing (CMP) processes, therefore it would have been obvious to one having ordinary skills in the art at the time the invention was made to disclosed a dressing step performed before the polishing step in the primary reference of Mravic et al. since Mravic et al. uses a CMP process.

Regarding disclosing a distance of the insulative film between adjacent openings within a range of 30 micrometers to 0.1 micrometers, and dishing and erosion on the planarized surface of 40 nm or less, Mravic et al. discloses a distance of an insulative film between adjacent openings and reduction of dishing on a planarized surface but does not disclose a particular value for this parameter. However, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a range of 30 micrometers to 0.1 micrometers for a distance of the insulative film between adjacent openings and dishing and erosion on the planarized surface of 40 nm or less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the "optimum range" involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Furthermore the claimed range values are only considered to be the "optimum" distance between adjacent openings and dishing values that a person having ordinary skill in the art at the time the invention was made would have been able to determine using routine experimentation based, among other things,

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on the desired accuracy, manufacturing costs, etc. (see In re Boesch, 205 USPQ 215 (CCPA 1980)),

As to disclosing purified water as a component in the aqueous slurry solution, Mravic et al. discloses an aqueous solution, therefore it would have been obvious to a person having ordinary skills in the art at the time the invention was made to use purified water for the aqueous solution disclosed by Mravic et al. since it would prevent undesired contamination in the solution. Furthermore, using purified water as a slurry solvent for aqueous slurries is well known in the art, therefore it would have been obvious to one having ordinary skills in the art at the time the invention was made to disclose purified water as one of the components of the slurry disclosed in Mravic et al. since Mravic et al. is using an aqueous slurry.

With respect to disclosing abrasive grains of a fixed abrasive tool comprising fumed silica fixed with a resin having a compression modulus of elasticity from 500 MPa to 1000 Mpa; using abrasive tools comprising fumed silica fixed with a resin having a compression modulus of elasticity from 500 MPa to 1000 Mpa for CMP processes is conventional in the art, therefore disclosing such apparatus limitations in the primary reference of Mravic et al. would have been obvious to a person having ordinary skills in the art at the time the invention was made since resin-fixed fumed silica abrasive grains having an elasticity modulus from 500 MPa to 1000 Mpa provide a desired mechanical force during CMP processes.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Layadi et al. and Wilson et al disclose methods for manufacturing semiconductor devices wherein for substrates as a workpieces in which insulation films are formed to the substrates, openings are formed in the insulation films conductive films are formed in the inside of the openings and on the surface of the insulation films, by planarizing the conductive films using fixed abrasive tools, the planarized conductive films are formed in the openings, said methods comprising; supplying a first processing liquid upon planarization of second conductive films and switching the supply of the liquid from the first processing liquid to a second processing liquid upon planarization of a second and a first conductive films. Wake et al., Sun et al., Aoki et al. and Pasqualoni et al. disclosed CMP slurries comprising aqueous hydrogen peroxide, malic acid, benzotriazole and purified water.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angel Roman whose telephone number is (703) 306-0207. The examiner can normally be reached on Monday-Friday 8:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on (703) 308-3325. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

AR
April 2, 2003



John F. Niebling
Supervisory Patent Examiner
Technology Center 2800